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The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

VOL. LI
No. 1315

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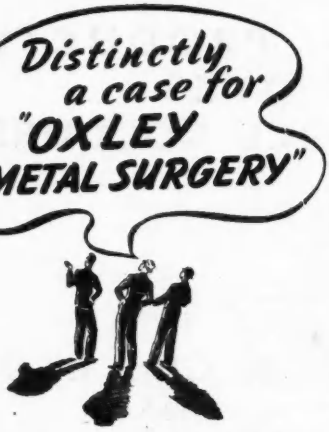

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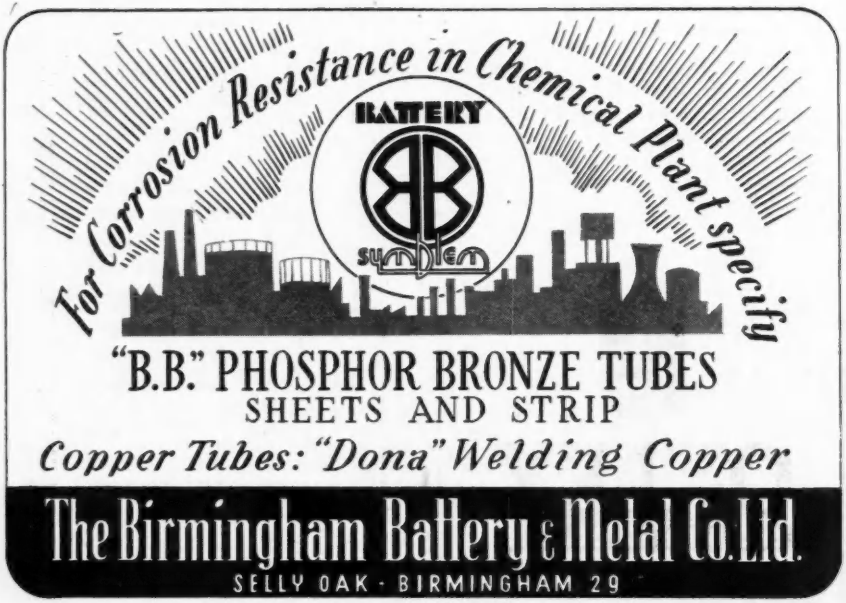

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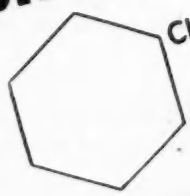

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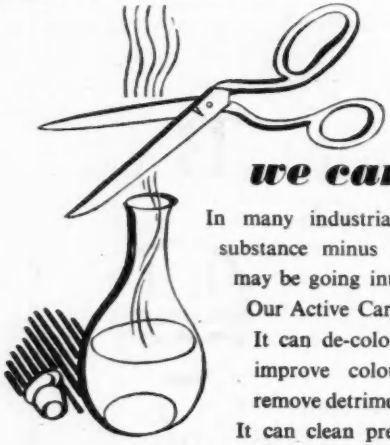

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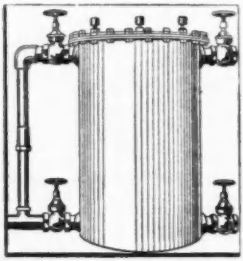

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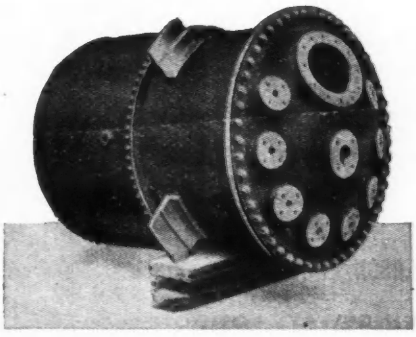

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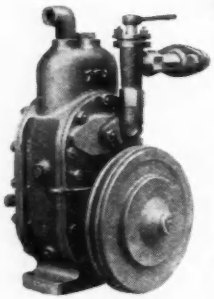

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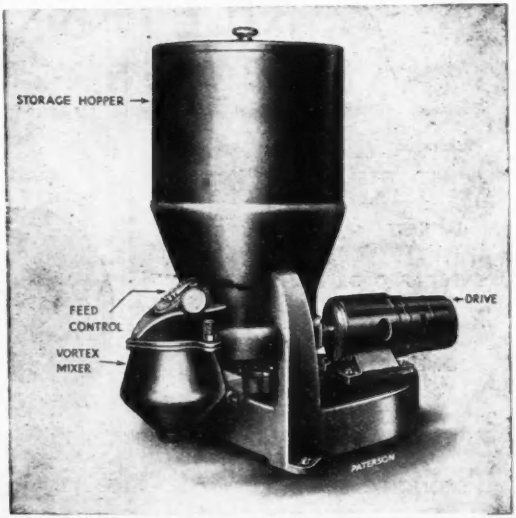

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September 9, 1944

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Patents and Research

THE Board of Trade has appointed a departmental committee to inquire into the operation of the Patent Law, and many bodies are now engaged in preparing or giving evidence before that committee. It seems likely that there may emerge some fundamental recommendations, which will profoundly affect our patent system. It is, of course, impossible to prejudge the issue and, in any event, we do not know at the moment what evidence is being put forward nor what view the committee is likely to take of that evidence.

There can be little doubt, however, that certain general principles require to be carried into effect which, although theoretically covered by the present Act, are not sufficiently safeguarded in practice. One of these is the power of the big combine or the wealthy firm against the smaller individual. There can be no question that a very large number of patents are taken out each year which are unworkable and even invalid. Some of these patents are nothing more than blocking patents to prevent others from entering the same field and to protect the main patent. It is a fact, however, that multiplicity of patents with the power of the purse behind it can effectively scare off anyone who is not similarly armed. It is surely possible to devise some cheapening of patent procedure which will enable the small man of limited means to take action against the big combine without the probability of failure of his action through lack of means. We do not in the least suggest what this procedure should be. That is for the committee to decide. It would, however, appear probable that one very good move towards ameliorating the situation would be to prevent the issue of invalid patents. One way of effecting this—perhaps the only way—would be to give more powers to the Comptroller to refuse patents. There are two schools of thought in regard to the extension of the powers of the Comptroller, but these can safely be left to fight out their case before the departmental committee, provided that the principle is borne in mind of endeavouring to bring about a drastic reduction in the number of doubtful patents granted.

The following passage occurred in a letter to *The Times* from "Two Lawyers" recently: "In spite of many reforms in legal procedure there are many respects in which the elaboration which still persists would be hard to justify if the advantages were set against the added expenditure. We believe

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that a substantial reduction in the cost of litigation might well be effected by a resolute attempt to simplify procedure and by reduction, if not elimination, of intermediate appeals. . . . It may be found necessary to reorganise the legal profession fundamentally or to abandon the idea, if it still persists, that justice ought to pay for itself. But it is urgent that a remedy should be sought. . . . A failure to put right the defect is a public danger." These words, written upon the cost of legal procedure, might well have been written specifically upon the patent position.

Whatever is done in the direction of modifying patent procedure will obviously be in accordance with the fundamental principle that patents are intended for the furtherance of trade. The object of a patent is to promote industry in the country in which it is granted. Patents are granted partly for the purpose of giving protection to those who are endeavouring to set up a new method of manufacture. It has been widely alleged that there are certain arrangements made by foreign firms, and particularly by German firms before the war, which have acted detrimentally to this country, in that manufacture here has been prevented, the British market being supplied from Germany or other overseas country. Just how far this allegation is warranted we do not profess to know. There are, of course, certain instances which have been published in the courts, but whether these are a few isolated cases or whether they are indicative of a general trend in that direction it is impossible to say. There should clearly be some patent machinery whereby arrangements of this sort are known to the Government and can be " vetted " in the public interest.

One of the principal bones of contention, to judge from the shots fired in advance, will be in regard to the granting of compulsory licenses for all patents. Under Section 38a, a compulsory license can be obtained by suitable people as a matter of right. It is argued by some that this provision is advantageous, that it has not prevented research into production of food or medicines and that it has led to the extension of trade. It is, however, argued by others that this provision should not be applied to other forms of invention or discovery primarily on the ground that it will lead to secrecy in place of the publication of a patent. While the final decision on this point must rest with the departmental committee, it is well to point out here that anything which will tend to re-establish the conditions of secrecy under which industry was so frequently governed in the last century would be highly detrimental to the progress of science and of industry in this country. It can well be imagined that if a firm or individual devised a new machine or a new process, a good deal of research would be necessary before it could be developed to a stage at which it could be put on to a large scale. The same company or individual might be prosecuting a number of other researches at the same time, most of which would not lead to any considerable advance. It would thus be impossible to state what was the cost of producing the new article or process and the Comptroller, in giving a compulsory licence, would have no sound basis on which to work from the cost aspect. The inventor would then have to put his machine or process on to the large scale. He may have already spent tens of thousands or even hundreds of thousands of pounds, but its ultimate success or failure cannot be predicted until it has been in operation for perhaps a year or two. At present there is every incentive to continue to develop an invention, but under a system of general compulsory licenses, competitors could sit back and wait until the invention had proved its value, after which it would be open to them to apply for a compulsory licence which the Comptroller would be forced to grant.

It will be noticed that in the present Act the wording of the section states that the Comptroller shall have regard to the desirability of making the goods available to the public at the *lowest possible price*. A great many considerations should lead to a good return to the inventor and a heavy royalty fee would thus be liable to be struck out by the officials concerned. To avoid losing the fruits of their enterprise, the firm would be driven to keep its invention secret.

The volume of published researches would also be materially reduced by the granting of general compulsory licenses. At present, when an invention has been adequately protected by patents, there is no possible objection to the publication of the researches which have led up to the invention. These are then available for

future workers and often lead to substantial advances in our knowledge of pure and applied science. They not infrequently lead to further inventions, or to extensions of the same invention. If conditions of secrecy were re-established, publication of scientific and technical papers would be materially restricted and we should have stepped backward into the age when it was difficult in the extreme to know what was being done in other laboratories and in other works. It is only 30 years since the works' managers of a particular chemical industry were forbidden to visit neighbouring works in case secrets may be conveyed thereby. The greatest care must be taken that we do not get back into these conditions by any unwise modification of patent procedure. This matter has been considered among others by the Chartered Institute of Patent Agents and a report adopted by the Council comes to the conclusion that a general system of compulsory licenses of patents is inadvisable on the ground that it would retard the progress of invention for the following main reasons: (1) Enterprise in developing and exploiting inventions would suffer on account of uncertainty and insecurity; (2) research by individual firms would be restricted; (3) the practice of secret working of inventions would develop wherever possible, thus removing the incentive to scientific progress which is derived from publicity and wide circulation of information.

NOTES AND COMMENTS

Relighting the Lamps

AT the beginning of the last war Sir Edward Grey, in a memorable phrase, spoke of his sadness as he watched the lamps of Europe going out one by one. Now, thirty years later, while the rest of the world holds its breath, the lamps of Europe are being relighted one by one. In the spring it was Rome; in ten days of late summer the turn has come of Paris, Bucarest and Brussels. And there are more to follow, with the glorious Allied armies closing in, at a speed never before attained in military history, on Berlin. While we properly rejoice at the liberation of one capital after another on the Continent of Europe, let us never forget one lamp which not only never went out but did not even flicker. London has suffered, and was suffering until a few days ago, on a far heavier scale than any of the capitals so far liberated. London's demeanour in the face of a brutal enemy has been an inspiration not only to the armies seeking to relight the lamps elsewhere, but to those struggling to emerge from the obscurity into which they had been plunged. It has been the privilege of THE CHEMICAL AGE to have played its own proud but humble part in the finest page of London's history. Its staff never thought of leaving London when the war began, it endured all its trials and tribulations, and it still carries on with head unbowed in the centre of Fleet Street.

Ploesti Occupied

THE Russian occupation of Ploesti is in its importance equal to the destruction of an army, for the loss of Europe's largest oil field will knock the bottom out of Germany's war economy. Of all the industries under German rule, the Rumanian oil industry received the greatest attention from the enemy. Without Rumania's oil, the Wehrmacht would have been crippled long ago. In the Ploesti area is the densest agglomeration of oil refineries in all Europe, a concentration comparable only to those on the Gulf Coast, in the Caucasus and on the Persian Gulf. Rumania's refining capacity amounts to 10,000,000 tons annually, the ten leading companies owning an annual refining capacity of about 8,500,000 tons. As a result of the exhaustion of old fields, Rumania's crude oil output declined from the peak level of 8,700,000 tons in 1936 to 6,250,000 in 1940, and further to an average of roundly 5,500,000 tons in the following years. Ever since Germany lost her financial interest in the Rumanian oil industry after the last war, she was bent on recovering her former position there. Step by step, through Schacht's policy of domination by adverse trade balances, by buying up shares, by blackmail and military force, Nazi Germany, assisted by the submissive Rumanian Government, gained total control over the country, and its oil resources, in 1940.

A Shattered Dream

THEN the Kontinental Oel A.G., a joint weapon forged by Germany's leading oil companies, banks, I.G. Farben and the Hermann Göring Works, was formed to acquire and control oil interests all over Europe. This combine, if the futile Nazi dream of victory had come true, would have become their instrument of their oil policy. In addition, a new oil law was passed introducing exploitation under unit control. Pipelines and transport were also controlled. Yet, in spite of all these strenuous efforts, Germany merely succeeded in stabilising the decline in output at about 5,500,000 tons of crude oil yearly. Out of this she derived approximately 3,000,000 tons, with which she had to supply the Wehrmacht and her industrial production, and to provide the meagre allocations to her allies and to the remaining neutrals. In August last, U.S. Fortresses based on the Middle East, struck the first heavy blow on Ploesti, and in the course of the oil offensive waged this year all the large refineries were put out of action. It is significant that the town's population has fallen from 100,000 to about 9,000. Although German demolition squads may have attempted to destroy the wells, it is unlikely that they were able to cement them: any oil fires the Germans started can be got under control with modern fire-fighting equipment and doubtless the Allies have made adequate provision for this contingency.

Australian Drug Production

AUSTRALIA is now making many of the drugs and medical supplies she requires. Last year some 700,000 lb. of acetyl salicylic acid were produced there, enough to meet local needs, while a plant has been completed that will yield 100 tons of phenacetin a year, this amount being twice the present domestic consumption. Australia's output of phenol meets all medical and industrial purposes; indeed, she has been exporting 500 tons annually to Great Britain and another 100 tons to New Zealand. Shark-liver oil is providing adequate supplies of vitamin A. This oil, which averages 10,000 I.U. per gram, is being exported at the rate of some 5000 gallons a year. Production of vitamin C is about 50 lb. a week. Large quantities of hyoscine, hyoscyamine and atropine are being extracted from a native tree, *Duboisia myoporoides*, and two other alkaloids, caffeine and theobromine, are produced in Australia, output balancing local requirements, but leaving no surplus. Manufacture of ether, chloroform, chlorobutanol, and chloral hydrate is more than adequate for the country's requirements. By 1942, the hydrogen peroxide turned out amounted to over 500,000 lb., some of which was exported. Sulphanilamide, sulphaguanidine, proflavine, and atebrin are being made, while an acridine derivative, 5-aminoacridine, becomes the first synthetic drug the complete chemistry of which was worked out in Australia.

Urea in Cattle Food

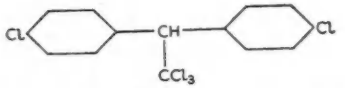
SOME time ago in our news columns we mentioned the use of urea as a partial substitute for protein in cattle feeds. The June number of *C-I-L Oval* contains some additional details. This use of urea is now apparently an established practice in Canada and the United States. The grade of urea which finds its way into cattle feeds contains 42 per cent. nitrogen. The results of numerous feeding tests show clearly that for cattle the protein which the cow synthesises from the urea is substantially equal in value to that supplied by oil-seed meals. There are limits to the amount of urea that may be used economically to replace true protein in cattle feed. The present recommendation is 1 per cent. of urea in the total ration or 3 per cent. in the supplement. A suitable concentrate may be prepared by mixing 3 lb. of urea with 97 lb. of grain. The use of urea in making silage is now the subject of investigation, preliminary results indicating that it may aid the retention of carotene or vitamin A in the forage. A successful trial is reported from the Mississippi Experimental Station, where urea was sprinkled on chopped sorghum as it entered the silo, at the rate of 10 lb. per ton. Its continuing popularity, suggests the journal of Canadian Industries, Ltd., does not merely depend on shortage of natural protein, but exists rather because urea presents, in condensed form of known standard quality, a convenient and readily measurable protein supplement.

DDT

Its Preparation and Potentialities

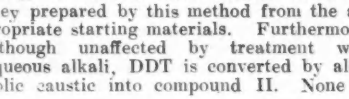
by G. A. CAMPBELL*, M.Sc., and T. F. WEST†, Ph.D., F.R.I.C.

DURING the past few weeks there has been considerable publicity in the lay Press relating to the insecticide DDT. The name is an abbreviation of the chemical name paradichlorodiphenyl-trichloroethane, although it is more correctly described as αα'-bis-(parachlorophenyl) - ββ - trichloroethane or 2.2.-bis-(parachlorophenyl)-1.1.1.-trichloroethane.



It was synthesised as early as 1874, but was forgotten until, in 1939, J. R. Geigy A.G. Basle claimed the use as insecticides of compounds of this class. The compound was such an unpromising intermediate that it is, perhaps, not surprising that it failed to attract the attention of chemists for more than 60 years, and the discovery of its insecticidal properties by the J. R. Geigy research workers was the culmination of years of work on synthetic insecticides.

In view of the comparative complexity of organic insecticides such as the pyrethrins, rotenone and the various synthetic thiocyanates, the biological properties of this simple structure are especially interesting and remarkable. DDT can be prepared by condensing chlorobenzene with chloral in the presence of sulphuric monohydrate, and is obviously a commodity of cheap price. Martin *et al.* have studied the toxicity as stomach poisons to *Manestra brassicae* larvae of various other derivatives which they prepared by this method from the appropriate starting materials. Furthermore, although unaffected by treatment with aqueous alkali, DDT is converted by alcoholic caustic into compound II. None of



Compound II

the compounds of structure similar to DDT approached the toxicity of the parent; nor did compound II. These authors concluded that " the insecticidal properties are to some degree specific to the $Cl.C_6H_4.CH.CCl_3.C_6H_4Cl$ molecule, although the range of analogous compounds tested is limited." It is possible to state that this result finds confirmation in unpublished work involving comparison as contact insecticides of a large number of related compounds.

During 1936/7 it was discovered by J. R. Geigy A.G. that small proportions of active ingredient mixed with an inert base provided a very efficient insecticide possessing remarkable ability to remain efficacious over prolonged periods. In 1939 the potato crop in Switzerland was threatened by an outbreak of Colorado Beetle. Geigy made available to the Swiss entomologist, Dr. R. Wiesmann, a preparation containing DDT under the name " Experiment No. G.1750 " (later known as Gesarol) and as a result of his experiments confirming the Geigy work it was possible to control the Colorado Beetle that season. There is some confusion in names as the early work published in Switzerland invariably refers to preparations containing DDT as *Gesarol*, *Neocid*, etc. In order to clarify the position and to give some indication of the manner in which DDT can be presented for use a list of these products is given below. Owing to its resemblance to an already registered name it was necessary to use the names *Guesarol*, etc. in this country.

Types of Preparation

Gesarol (*Guesarol*) *dusting powder* contains 5 per cent. DDT on inert carrier. *Gesarol* (*Guesarol*) *spray* is a white powder containing 5 per cent. DDT, together with wetting and suspension agents to assist stability of the spray which is ultimately prepared as an aqueous suspension containing 1-2 per cent. of Guesarol spray powder in water. *Gesapon* (*Guesapon*) is an emulsion containing 5 per cent. DDT. *Gesarex* (*Guesarex*) is a combined insecticide and fungicide containing 5 per cent. DDT. *Neocid powder* contains 5 per cent. DDT on inert carrier and is designed for human and animal use.

DDT itself is a white, somewhat waxy solid with a very faint, fruity odour. It is practically insoluble in water, but soluble in organic solvents. For convenience a list of solubilities is given overleaf.

DDT is very stable, unaffected by light and air or by water and can be used in emulsions without loss of efficacy. The introduction of solubilising groups into the molecule reduces the insecticidal properties.

When DDT was introduced into this country in 1942, it was already accepted in Switzerland (under its Gesarol preparation) as being effective against the Colorado beetle, cabbage butterfly, leek moth, onion fly, raspberry beetle, and other pests, but it was

* Of Geigy Colour Co., Ltd.
† Of Stafford Allen & Sons, Ltd.

necessary to re-examine the product for conditions in this country and in the U.S. The results of preliminary trials against a wide variety of pests already published in the United States are extremely promising, and it is hoped that results will soon be published of experiments in hand in this country.

Approximate solubilities of DDT in various solvents at ordinary temperatures expressed in grams per 100 grams of solvent.

Ether	45
Benzene	106
Toluene	48
Chloroform	96
Tetrachloroethane	56
Petrol ether 40-60° b.p.	6
Petrol ether 100-120° b.p.	10
Ethanol (99.5 per cent.)	4
Cyclohexanol	8
n-butyl alcohol	8
tert-butyl alcohol	4
Ethyl acetate	68
Tetralin	52
Liquid paraffin	4
Orchard and spray oil	5
Kerosene (vaporising)	11
Sextone	100

DDT in War

In an article of this scope it is obviously impossible to cover the whole field, but the unique properties of DDT can be seen from the work carried out for uses by the armed forces against typhus. In 1942, owing to the acute shortage of pyrethrum and derris —the natural insecticides used at that time to control the insects responsible for malaria (mosquitoes) and typhus (lice)—many substitutes were being tested as alternatives. In 1942 the J.R.Geigy Company drew the attention of the British Legation to the importance which they attached to their discovery of DDT, and the British Geigy Company in Manchester brought the compound to the notice of the authorities here. The early tests were extremely promising, and quickly confirmed the observations of Wiesmann of the efficacy of DDT against lice. Almost immediately teams were formed of Government, university, and industrial research workers and the many aspects which required investigation before adoption of a product for the armed forces were investigated. Simultaneously pilot-plant production, based on the J.R. Geigy experience, was put in hand so that difficulties associated with larger-scale production could be anticipated. The story of the success of the ambitious programme undertaken by workers in this country, the United States and the Dominions has been described in the daily Press. Although production figures for this country are not available owing to security regulations, some idea of the immensity of the purely technical problems involved can be gleaned from the announcement that the present monthly production of DDT in the United States is 300,000 lb. per month and output is expected to reach 1,700,000 to 1,900,000 lb. early in 1945.

All the DDT produced is at present reserved for the use of the armed forces, small quantities being available for approved trials only. Research on the control of human lice with DDT led to three main uses. The DDT powder recommended for the armed forces was found effective in providing protection for about three weeks, and although it possessd no ovicidal properties this duration exceeded the normal incubation period of body-louse eggs. By treating clothing with DDT solutions of suitable strength, it was found possible to impregnate articles such as clothing so that they withstood about six launderings accompanied by about six weeks' wearing. Finally, liquid preparations were evolved for use in the complete delousing process and were found especially suitable against infestations of head- and crab-lice.

In Naples during January this year 1,300,000 individuals were dusted with a DDT louse-killing powder, and the typhus epidemic which had broken out was checked. This was the first time in medical history that such an epidemic has been controlled in mid-winter, and illustrates how one isolated discovery can sometimes modify overnight the accepted attitude towards one of the scourges of humanity.

Some Practical Results

The capacity of becoming adsorbed on to a surface which then remains toxic for a prolonged period is one of the most important properties of DDT. For instance, it has been reported that mortality of bed-bugs present in an infested house was observed as long as 104 days after the application of a solution containing 10 per cent. of DDT and 5 per cent. of cyclohexanone in kerosene. Tests in barrack rooms, a theatre and a dairy with an aqueous emulsion containing 5 per cent. DDT and a talc dust containing 10 per cent. of DDT showed a considerable reduction in the population of cockroaches. Another report describes the use of Neocid (5 per cent. DDT powder) in a large restaurant. The powder was applied with a hand duster and after two days it was reported the insects "ran all over the place and the situation seemed completely out of hand." After a few days, however, the cockroaches had completely disappeared, although none of the dead insects could be found. The breeding places appeared to be made untenable for a prolonged period, because even after four months it was reported that only an occasional large coackroach was seen, which had presumably entered from outside as no young cockroaches or egg-bearing females were seen. Swiss work dealt with the spraying of the walls and ceilings

of shippons and barns with a 1 per cent. suspension of Gesarol spray, *i.e.*, a suspension in water containing inert filler and only 0.05 per cent. DDT. This dried to leave a deposit on the surfaces sprayed to which flies were extremely sensitive; after only 30 seconds contact flies died after a day or two, but longer contact—about ten minute—caused death within a few hours. It is essential to emphasise that DDT does not possess the knock-down action of pyrethrum, and it is unlikely that pyrethrum will lose its popularity in sprays designed for controlling flying insects such as flies and mosquitoes. It seems probable that the household fly-spray of the future will consist of pyrethrum or one of the thiocyanates in combination with DDT, the latter being used in much the same way as rotenone, which was included in some sprays before the war to increase the final kill.

Under normal conditions and at the necessary concentrations, it seems unlikely that DDT preparations will be sufficiently toxic to warm-blooded animals to interfere seriously with its use. In dry form, or suspended as a powder in aqueous solutions, DDT preparations are harmless to man, but, of course, the usual precautions should be observed to avoid undue inhalation of dust or fine spray. Army medical authorities recommend that solutions in organic solvents be handled by trained personnel properly protected to avoid prolonged exposure of these solutions to the skin. Ingestion is not recommended.

In this brief survey we have attempted to give a bird's-eye view of the DDT position, and for detailed results on any particular aspect the references given below should be consulted. It is clear that there is good foundation for the Press statement that DDT is one of the major scientific discoveries of the past decade.

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Chlorine Dioxide

A New Process of Manufacture*

CHLORINE dioxide is a powerful oxidising and bleaching agent, but because of its chemical instability it cannot be produced in bulk and stored. It must be generated in very low concentration at the point of use.

Several methods of doing this have been developed since the compound was first identified by Davy in 1815.[1] All of them, however, have limitations of one sort or another which have prevented their wide application in industry. Among the earliest processes were several involving treatment of potassium chloride with sulphuric acid according to the reaction

$$3KClO_3 + 2H_2SO_4 \rightarrow KClO_4 + 2KHSO_4 + H_2O + 2ClO_2$$

These were unsuccessful chiefly because they produce chlorine dioxide mixed with chlorine, the production efficiency is low, and the acid gives rise to serious corrosion troubles. Also, no solution had been found for the problem of controlling the output of chlorine dioxide in very small quantities at a strictly regulated rate.

When sodium chlorite was introduced as a commercial product, a series of processes for generating chlorine dioxide was developed using this compound as the raw material. In 1939, Logan[3] patented an electrolytic method based on the reaction :

$$2NaCl + 2NaClO + 2H_2O \rightarrow 2ClO_2 + 2NaCl + 2NaOH + H_2$$

This process produces chlorine dioxide under satisfactory conditions for use in bleaching flour in mill-scale experiments,[2] but requires complicated equipment and the services of an electrochemist. It was therefore abandoned when simpler and purely chemical processes were introduced. The first of these chemical processes, patented in 1936 by Cunningham and Losch,[5] was based on the fact that when chlorine is introduced into a solution of sodium chlorite, the following reaction takes place at room temperature :—

$$2NaClO_2 + Cl_2 \rightarrow 2NaCl + 2ClO_2$$

Equipment used for carrying out this process, developed by Logan and Petroe[4] and later modified by Woodward, is shown in Fig. 1. This process, utilising suitable control, measuring, and safety devices, is practicable. However, in 1943, Hutchinson and Mecham patented a method of generating chlorine dioxide by treating *dry* sodium chlorite with chlorine.[6] The advantages of a dry process from a corrosion standpoint are obvious.

The equipment for generating chlorine

* From a paper entitled " A New Process for Producing Chlorine Dioxide for Industrial Use," by E. R. Woodward, G. A. Petroe and G. P. Vincent, of the Mathieson Alkali Works, New York, presented to the American Institute of Chemical Engineers, May 15, 1944; condensed from *Chemical Industries*, July, 1944.

dioxide by the chlorine-dry chlorite process consists of two principal parts—a two-tower generator, with means for supplying chlorine and air, and a cabinet, which houses the control and measuring apparatus (Fig. 2). The generator consists essentially of two vertical steel towers, 4 inches in diameter and 3½ feet high, lined with stoneware or glue. Each tower is filled almost to the top with about 8 lb. of flaked commercial sodium chlorite, of approximately the composition shown in the table below. A mixture of chlorine, which is supplied at the rate of 0.05 to 1.5 cu. ft. per hour, and a large excess of air, at a pressure between 2 and 5 lb./sq. in. is fed into the bottom of one of the towers. Chlorine dioxide, formed within the tower, is carried out at the top by the air current. The ClO_2 then enters the base of the second tower, and passes out at the top into the mixed gas manifold. The operation takes place at room temperature.

The principal reaction within the tower is:—

$$2NaClO_2 + Cl_2 \rightarrow 2NaCl + 2ClO_2$$

but, as shown by the following table, small amounts of sodium chlorate are also formed.

TYPICAL ANALYSES OF TOWER CHARGE.

	Fresh Charge per cent.	Spent Material per cent.
$NaClO_2$	83.00	0.05
$NaClO_3$	5.00	7.68
NaCl	6.00	88.33
Na_2CO_3	0.75	—
H_2O	5.25	3.94

When chlorine is fed at a uniform rate into a fresh charge under normal operating conditions, a lag occurs initially before the system attains equilibrium. (This lag can be reduced by increasing the chlorine flow at the start for a short time.) Chlorine dioxide is then generated at a uniform rate. As the charge nears exhaustion, chlorine begins to appear with the chlorine dioxide. When free chlorine is discharged together with the chlorine dioxide from the first tower, it reacts during its passage through the charge in the second tower, so that the output of the second tower is free from chlorine. At this point, however, the first tower is disconnected and recharged, while the second tower alone is used temporarily for generation. Then the freshly-charged tower is reconnected, this time as the second tower, and operation continues without interruption.

The amount of chlorine dioxide generated varies directly with the amount of chlorine supplied to the generator. Hence, the output of chlorine dioxide can be accurately regulated by varying the input of chlorine. The chlorine from the supply cylinder passes through a pressure-reducing valve, which reduces the pressure to 5¼ lb./sq. in., and then through a glass capillary, which cuts down the delivery to approximately the

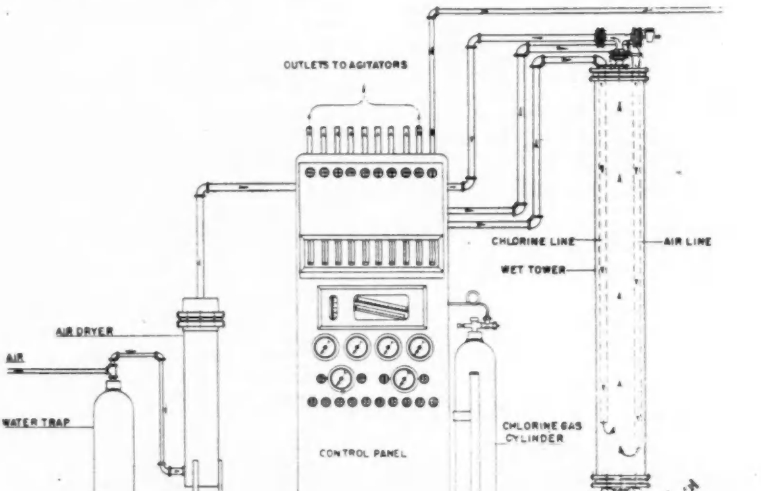

Fig. 1. Schematic drawing of a single tower chlorine chlorite-solution generating unit. (Reproduced from *Chemical Industries*.)

amount desired. Adjustment of the flow of chlorine to the capillary is by a hand-operated needle valve. The rate of flow of the chlorine is measured by a manometer, which records the pressure drop through the capillary. Carbon tetrachloride is used as the manometer liquid. The chlorine flow is set by adjusting the needle valve until the meniscus rests at the required point in the manometer.

To prevent chlorine from being fed into the generator, unless amply diluted with air, a valve operated by the pressure of the air supply opens the chlorine line when the air is turned on and closes it when the air is shut off. The chlorine line contains three filters consisting of a piece of Pyrex pipe packed with glass wool and silica gel, and there is a valve close to the supply cylinder, for clearing the line of chlorine when the generator is shut down and for permitting the escape of the gas, should the cylinder valve leak. All chlorine-carrying parts of the system are made of non-corroding materials, such as silver, Hastelloy-C, glass, and plastics. Silver is used for the high-pressure tubing, and Saran for the low-pressure tubing. The use of iron is avoided as much as possible to reduce the formation of a gummy substance, composed largely of ferric chloride, that tends to clog up piping, valves, and other parts of the equipment.

Air for operating the generator, supplied by a compressed air system or an individual compressor, passes through a water trap, a calcium chloride drier, and a pressure-reducing valve. This valve maintains a pressure of 5 lb./sq. in. Final adjustment of the air-flow before it enters the generator is secured by means of a needle valve. A second line goes to the air-operated control valve in the chlorine supply line; and a third line goes to a manifold, from which by-pass air can be drawn for diluting the chlorine dioxide in the distribution lines, should this be necessary. If the ratio of chlorine to air exceeds 5 per cent. when fed into a charged tower, an explosion hazard is created due to the rapid generation of chlorine dioxide at a partial pressure above 70 mm. of mercury. In addition, the heat of reaction converts much of the sodium chlorite into sodium chlorate, according to the equation

$$3NaClO_2 \rightarrow 2NaClO_3 + NaCl.$$

As sodium chlorate is an oxidising agent, it will set fire to any organic material it touches, when heated above its fusion point of 248° C. Sodium chlorite is also a powerful oxidising agent and can set fire to organic materials under similar conditions.

To guard against this hazard, the towers are mounted over apertures in a box-like sheet-steel base, and each tower is closed

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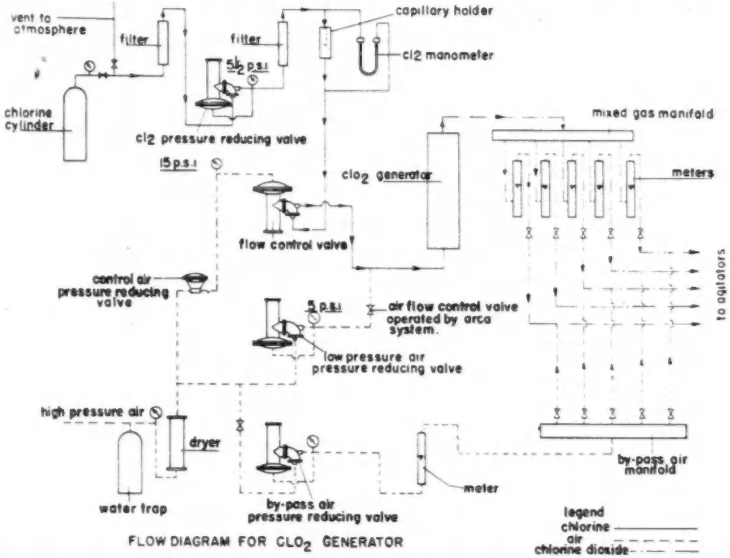

Fig. 2. Flow-sheet showing single generating tower and five chlorine dioxide distribution lines. (Reproduced from *Chemical Industries*.)

Belgium's Chemical Industries

A Topical Survey

from a Correspondent

WITH the Allied armies firmly established within the borders of Belgium, that country's complete liberation will now be only a matter of a very few weeks. A survey of her chemical and metallurgical industries therefore becomes of topical interest. Although the Nazis have attempted to hide the economic and industrial conditions of occupied Europe behind a sort of smoke-screen, a good many facts have filtered through by way of neutral countries and through the German press and radio. It is known, for example, that now, in the fifth year of German occupation, Belgium's industrial output is far below pre-war level.

The pretence that coal output is as large as before the war has been abandoned; and it is admitted that coal output can only with difficulty be maintained at four-fifths of the 1939 level. Only a fraction of the steel-making capacity is reported to be working. The largest coal and steel concern, the S.A. Ougrée-Marihaye, reports that, during the financial year 1942-1943, only 27 per cent. of its steel-making capacity was utilised. Restrictions on every kind of civilian production failed to keep up the output essential to Germany's war industry. Production has stagnated at a low level and the concentration of firms has continued, particularly in the glass industry, which before the war was mainly an export industry. In every industry expansion of productive capacity is prohibited, and the stagnation process is accelerated by the removal of labour and material out of the country or its transference to construction of military installations. Conditions in Belgium are, in fact, much the same as during the last war. Belgium was then soon able to shake off the influence that Germany had gained over her industry and she will equally well recover after this war.

The Coal Industry

Belgium's leading industry is coal mining, which has long been fully developed. The Borinage district in Southern Hainault, centering round Charleroi and Mons, and the province of Liége together form the Sambre-and-Meuse coal field. The mines yield coal of different qualities suitable for the iron and steel industry, for gas production, for glassworks, and for almost every description of industry. In the north-east is the Campine, a wide tract between Antwerp and Maastricht, where the first borings were made in 1909. The coal of the Campine is chiefly of the long-flame variety, much prized in gasworks, and the output should make it unnecessary for Belgium within a few years from the end of the war to import coal. Belgium's coal production in 1938 was 29,585,000 metric tons.

The various Belgian industries are situated near the coal mines of Charleroi, Genck, Gilly, Liége, and Quaregnon; or where the necessary raw material is found, *e.g.*, glassworks in Charleroi and Jumet, heavy and metal industries in Charleroi, La Louvière, Liége, Molenbeek-St. Jean, Montigny-sur-Sambre, Ougrée and Séraing, tanneries in Soignies, soap in Forest, cement in Courtrai, Eupen, Tessenderloo and Tournai, oil refineries in Hoboken. The chemicals industries are mainly in Greater-Brussels, as at Anderlecht, Forest, Ixelles, Ghent, Ougrée (near Liége), Vilvorde (near Brussels), etc.

Metal Industries

Belgium, though close to the extensive iron-ore fields of Lorraine, Luxembourg, and the Saar, is not rich in iron ore, of which, in 1938, she only mined 261,415 tons. Some iron mines are still in full working order in the provinces of Namur and Liége, but the output has been gradually diminishing. The important Belgian iron and steel industry, in the Sambre-and-Meuse district, working mainly with imported ores, produced 3,020,000 tons of pig iron and ferro-alloys, and 3,062,600 tons of steel ingots and castings in 1939. The leading Belgian iron and steel works, integrated with their dependent industries, are among the largest enterprises in the world: the Ougrée-Marihaye group, which includes mines, quarries, blast-furnaces with the associated manufacture of cement, breeze-blocks, tarmac, etc., coke ovens, rolling mills, foundries, and structural steel workshops, employs 15,000 people. The John Cockerill Company has ten similar production departments with a total staff of 13,000. The Englishman, John Cockerill, went to Liége a century ago, and founded the great enterprise which still bears his name. There he fired the first coke blast-furnace in continental Europe, and manufactured Europe's earliest locomotive and first rails.

The non-ferrous metal industries have grown greatly in importance during the last twenty years. The zinc industry, the most important in the group, was originally based on ores of La Vieille-Montagne (near Liége) but has long had to rely on imported ores. The first zinc sheet made in Europe was produced about 1808 in Belgium (THE CHEMICAL AGE, 1940, *43*, p. 113). Almost all the zinc ore required latterly was imported from Geat Britain, Australia, Ger-

Belgium's chemical and metallurgical industries.

many (mainly Silesia), France, and Spain. The total production of zinc in Belgium in 1939 was 204,697 tons—over 13 per cent. of world total. The production of high-grade zinc is some 20,000 tons per annum. The Overpelt works of the Cie. des Métaux d'Overpelt-Lommel et Corphalie produce zinc over 99.99 per cent. pure. High-grade metal is also produced by the electrolytic plant of the Vieille-Montagne Company at Baelen, which has an annual capacity of 8000 tons. The same plant was the biggest producer of cadmium in Europe.

Copper production before the war amounted to over 150,000 tons yearly. The chief raw material was ore and crude metal from the Katanga district of the Belgian Congo. The Oolen plant of the Société Générale Métallurgique de Hoboken alone has an annual capacity of 110,000 tons. The same plant is the world's largest producer of cobalt and radium, production of which is also based on raw materials from the Congo. The content of cobalt in oxide and salts produced at Oolen from material shipped from the Congo in 1938 was 3,378,000 lb.

Belgium produces lead on a large scale (105,821 tons in 1939), and tin from Congo ores (9663 tons in 1939), silver (405,560 kg. in 1937), gold, tantalum, uranium, thallium, and niobium. The S.A. des Usines de Nickel de la Nèthe possess the only Belgian nickel works and their articles and non-ferrous metals in general, including brass and other alloys, are supplied in every form, and in some cases in powder, mostly for export.

Important also is Belgium's glass industry, for which most of the raw materials are available on the spot; and sand found in Hainault and Namur is of good quality for glassmaking and still better is the excellent pure sand of the Campine, where a glass factory has been established since the last war. Old-established glassworks were at Tamines, near Charleroi, and at Val St. Lambert, near Liége.

Among strictly chemical industries, the one most closely associated with Belgium is the ammonia-soda process, developed by the Belgian industrialist Ernest Solvay. Although the ammonia-soda reaction was discovered by Fresnel about 1810, it was not successfully worked on a commercial scale until Solvay took out his first patent in 1861 and first worked the process on a large scale near Nancy in 1872. Up to the outbreak of war the Solvay concern, Brussels, controlled the ammonia-soda industry throughout the world; the process is more economical and gives a purer product than the Leblanc process, and is not likely to be displaced except by electrolytic processes.

At the head of the chemical industries appears Union Chimique Belge S.A. with

a capital of 127,500,000 francs; it has works at Burght (near Antwerp), Forest, Ghent, Havré-Ville, Hemixem (near Antwerp), Monumont, Droogenbosch (near Brussels), Saint-Ghislain-Schoonaerde and Zandvoorde. These factories produce all types of inorganic and organic chemicals, as well as pharmaceutical and photographic articles under the trade names, respectively of *Meurice* and *Fotobel*. Recently, synthetic rubber has been produced by this company. The Etablissements Kuhlmann, which controls 16 works in France, has three subsidiaries in Belgium for the production of superphosphate, sulphate of ammonia, various other fertilisers, and tar-products.

Produits Chimiques de Tessenderloo S.A. manufactures acids, alkalis, liquid chlorine, hypochlorite of soda, phosphates and, more recently, explosives. S.A. des Produits Chimique de Laeken is well known for its wide range of inorganic chemicals. Société Belge de l'Azote S.A. in Remory and Ougrée-lez-Liége makes nitrogen fertilisers, insecticides and other agricultural devices. Solvay & Co. control several establishments turning out soda, sodium bicarbonate, and recently trichlorethylene. Persil S.A., Brussels, manufactures various cleansing materials and blues. S.A. Vedrin in Saint-Marc, a suburb of Vedrin, specialises in bichromates, liquid carbon dioxide, and barium salts. It would take far too much space to mention the many firms producing margarine (Antwerp and Brussels), edible oils (Duffel and Brussels), mineral oils, dyestuffs, soap, etc.

Some Chemical Figures

The Fédération des Industries Chimiques de Belgique has published estimates of the annual production of some chemical products in Belgium in 1938, as under:

	Tons
Aluminium sulphate	38,000
Ammonium sulphate (synthetic) ...	260,000
Ammonium sulphate (other) ...	90,000
Calcium chloride	18,000
Superphosphates	250,000
Iron sulphate	8,000
Sodium hypochlorite	3,500
Gelatine	15,000
Glue and size	3,500
Soap	90,000

The following figures indicate the production capacity of certain leading chemicals in the same year:

	Tons
Hydrochloric acid	100,000
Nitric acid	40,000
Sulphuric acid	over 1,000,000
Sodium sulphate	100,000
Borax	3,000

This is far from being a complete picture of the Belgian chemical industry, which manufactures very many other products. It can be said that every branch of applied chemistry is well represented in Belgium, working less for home consumption than for export, which used to average 75 per cent. of total production.

In the following table some export figures for 1939 are appended.

	Quintals of 100 kg.	Value in 1000 Belgian francs
Minerals	138,182,868	2,560,773
Chemicals and drugs ...	20,191,036	409,959
Soap, processed wax, etc	44,679	13,134
Glass and glassware ...	1,944,739	501,037
Metals and metal manufactures	39,219,940	6,245,902

Chemical and technical education and research were well developed at the Universities of Brussels, Ghent, Liége, and Louvain, and at certain technical colleges. Many of the professors have escaped the German occupation, and will no doubt return to continue their valuable work. Some of them are now serving abroad, including Professor Jean Timmermans, of the University of Brussels, who published his most recent book *Chemical Species* in London (THE CHEMICAL AGE, 1941, 45, p. 94).

Belgian economic and industrial life has been dislocated, and, in fact, deliberately confined, by the Germans, who appointed a certain Victor Leemans as Director of the Department of Economic Affairs in Belgium, with the task of incorporating Belgian economic life into the German system. Moreover, recent reports place the cost to the country of every German soldier on Belgian soil at the equivalent of some £2000 a year, while the war contribution now exacted by the Nazis from Belgium is estimated at the equivalent of £10,000,000 each month. The financial agreements, however, which have been concluded or are approaching conclusion between the United Kingdom and the United States on the one side and the Allied Governments of Holland, Belgium and Norway on the other are hopeful preliminaries of economic reconstruction in the broadest sense

FOREIGN SCIENTISTS IN LONDON

The Society for Visiting Scientists, with premises at 5 Old Burlington Street, W.1, has been founded on the initiative of the British Council, in consultation with the Royal Society, to provide a meeting place and information centre where scientists can be given advice and information about scientific institutions in this country. London, hitherto, has had no centre of this kind, for it is not part of the ordinary work of scientific societies to look after the more general needs of visiting scientists. The information centre will be at the disposal of visiting scientists, and any scientist arriving in Britain can go at once to the house, use the facilities offered, and find out how he may apply for membership. The president of the society is Professor F. G. Donnan, who is also the acting chairman, and the chairman of the honorary council is Field-Marshal Smuts.

Alcohol from Sulphate Liquor

Report on Canadian Plant

PRODUCTION of industrial alcohol from waste sulphite liquor by the Ontario Paper Co., Ltd., at Thorold, Ontario, is reviewed by C. A. Sankey, the company's research director, in a paper presented to the Chemical Engineering Section of the Canadian Chemical Conference, held at Toronto in June, 1944. The paper is published in its entirety in *Canadian Chemistry and Process Industries*, 1944, 28, 7, p. 464.

Waste sulphite liquor contains sugar derived from wood. Some sugar is present in all wood and considerably more is formed during sulphite cooking by hydrolysis of the hemicellulose. Over two-thirds of the total reducing sugars in waste sulphite liquor are fermentable, and therefore capable of conversion into alcohol under the action of yeast.

The bulk of the alcohol-from-waste-sulphite-liquor industry has been in the Scandinavian countries. These countries lack oil and coal, which are the primary raw materials for fuels for internal combustion engines, and power alcohol produced from domestic raw material is, therefore, of importance in their national economy.

War-Time Impetus

The industry has received strong impetus in Europe during war-time, especially as waste sulphite liquor provides an alternative both for unobtainable molasses and for foodstuff (grain or potatoes) raw materials.

The dilute sugar content and the chemical character of the liquor itself introduced technical and operational problems which made the process appear marginal under North American conditions, and especially so in the absence of such outlets as power alcohol for admixture with petrol. As a result, very little industrial development has been attempted and none maintained on the continent of America.

Certain advances have, however, been made, and these added to the forces which have furthered production elsewhere, provided a basis for the development in Canada. The plant was put up by the Ontario Paper Co., Ltd., at its own expense, at the request of the Canadian Department of Munitions and Supply, to assist in supplying the war demand for ethyl alcohol, urgently required in this war because of the demands for butadiene and styrene for synthetic rubber, as well as the other war requirements for explosives, as a solvent and as a raw material for other products. It is the only one of its kind in America.

At Thorold, the fermentation procedure used is the so-called "re-use of yeast" process developed by Les Usines de Melle* and under whose patents the Ontario Paper Co., Ltd., is licensed. This process has been previously in industrial use in at least 100 distilleries, but not in North America. There were also, in 1939, five plants in Europe where the method was used on waste sulphite liquor. Four of these were in Germany, namely the Wagen, Cosel, and Oberleschen mills of Zellstoff-fabrik Waldof and the Heidenau mill of Zellstoff-fabrik Aschaffenburg. One was in Switzerland at the Fabrique de Cellulose de Bois d'Attisholz.

The Melle Process

The essential feature of the Melle process is that, after fermentation, the fermented wort is run through a centrifugal separator to remove the yeast. This yeast is then re-used in a following fermentation in the operating cycle. The basis of this process is that when yeast is present in a suitable medium containing sugar, the course of the resulting fermentation tends to divide into two stages. In the first stage, the yeast cells multiply, using sugar for food, until there are so many yeast cells present that these are crowded. During this stage there is maximum growth of yeast and minimum production of alcohol. In the second stage, the yeast reduces its rate of budding, or division, and continues to feed on the remaining sugar present. During this stage there is minimum growth of yeast and maximum production of alcohol. The idea of re-using the yeast is to establish at once, in each new fermentation, the crowding of yeast cells that was present at the end of the previous fermentation. In this way, the fermentation is limited to the second stage and the alcohol yield therefore improved.

Operating throughout the entire fermenting cycle, at a yeast concentration promoted by the Melle process, offers important advantages in the case of waste sulphite liquor. Since large volumes of fermenting liquor are involved, prolific yeast growths must ensue before the proper concentration is reached if the initial inoculum is small. This yeast growth is obtained at the expense of sugar which would otherwise produce alcohol. At the same time, because waste sulphite liquor is, at best, a dilute sugar solution, the sugar required for yeast growth represents a greater proportion of the total than in the case of more concentrated sugar solutions from molasses or grain. The advantages of the Melle process in increasing alcohol yields are, therefore, much greater in the case of waste sulphite liquor than in application to the more conventional raw materials. In addition to the above, the re-use process introduces certain other very important advantages. The first is that it

* Les Usines de Melle, assignee of Firmin Boinot, Canadian Patents 341,720; 348,549; 402,847.

establishes acclimatisation of the yeast to a maximum degree. It is well known that yeast functions more effectively in a medium to which it has become accustomed.

The second additional advantage is that the danger of infection by other micro-organisms is very greatly reduced. Three factors contribute to this : (1) the fermentation conditions are adjusted to promote minimum growth of yeast consistent with the maintenance of a virile culture. Correspondingly, conditions for the growth of infecting micro-organisms are not favourable, for the long growth period at the beginning of the fermentation cycle is eliminated, and added nutrients are minimised; (2) the contaminating organisms are normally lighter than the yeast and hence are not separated with the yeast in the centrifuges, but remain in the wort and go to the stills where they are killed.

dustrial picture of increased yield is apparent from Table I, in which fermentation data on groups of consecutive fermentations, one of each group being started with fresh yeast, are summarised. It is to be noted that these are not carefully controlled comparative experiments, but actual operating experience.

The fresh yeast used for starting all fermentation series has been baker's yeast, grown in waste sulphite liquor supplied from the Thorold plant and therefore already somewhat acclimatised. The fresh yeast quantities are large compared with a conventional inoculum, especially in the first two groups, and the fresh yeast is also favoured by very much increased amounts of nutrient. The fermentable sugars given as "last test" do not represent the full fermentation time. This is a routine control test which is usually run approximately every 8 hours during the cycle. The "time

TABLE I

Ferment. No.	Yeast added per 44,000 gal.	Nutrient added (urea)	Fermentable Sugars Start (g./100 c.c.)	Fermentable Sugars Last test (g./100 c.c.)	Time of ferment	% Alcohol in wort
GROUP I :—						
99	300 lb. fresh yeast	100 lb.	1.27	0.19	36¾ hr.	0.66
97	27th recycling	25 lb.	1.32	0.15	22½ hr.	0.87
98	15th recycling	25 lb.	1.30	0.20	30 hr.	0.80
100	28th recycling	25 lb.	1.26	0.12	21 hr.	0.85
101	16th recycling	25 lb.	1.26	0.18	18 hr.	0.72
	Recycled yeast Average		1.29	0.16	23 hr.	0.81
	Average increase in yield = 22.7%					
	Average decrease in time = 37%					
GROUP II :—						
148	300 lb. fresh yeast	100 lb.	1.70	0.23	47½ hr.	0.82
146	28th recycling	20 lb.	1.53	0.00	21½ hr.	0.95
147	41st recycling	20 lb.	1.50	0.05	20½ hr.	0.95
149	10th recycling	20 lb.	1.60	0.00	13½ hr.	0.97
150	14th recycling	20 lb.	1.60	0.04	19 hr.	0.96
	Recycled yeast Average		1.56	0.02	18½ hr.	0.96
	Average increase in yield = 17.1%					
	Average decrease in time = 61%					
GROUP III :—						
306	150 lb. fresh yeast	50 lb.	1.63	0.18	69¾ hr.	0.81
304	30th recycling	25 lb.	1.62	0.04	29 hr.	0.90
305	40th recycling	25 lb.	1.74	0.08	27½ hr.	1.00
307	41st recyling	25 lb.	1.64	0.08	26 hr.	1.00
	Recycled yeast Average		1.67	0.07	27½ hr.	0.97
	Average increase in yield = 19.8%					
	Average decrease in time = 61%					

Thorold experience has established that the problem of infection in waste sulphite liquor fermentation is commercially solved with the re-use method. In nearly a year's operation there have been no infection problems. Although waste sulphite liquor, as a raw material for fermentation, has the important quality that it is completely sterilised from the sulphite digesting process, yeast infection and devitalisation was one of the principal difficulties connected with the older processes of waste sulphite liquor fermentation and the advantages of the re-use process will be apparent.

In Thorold operation, improved yields were obtained on successive re-cyclings. The in-

of fermentation" will thus end, on the average, about 4 hours after this test, and the latter also does not represent the full time of contact of the yeast with the liquor since the fermenters are allowed to settle for a variable period (dependent on fermented beer inventory) and also, on the average, for half the pumping time to the separators.

The time of fermentation is dictated not merely by the residual fermentable sugars at last test, but by the demand for beer for the still. In Group I the fermenters were being cut off rapidly on this latter account and it is to be noted that the increased yield is higher, as would be expected.

As regards the general flow of materials

in the Thorold plant, sulphite liquor from blow pits is pumped over an inclined wire screen into a 100,000 Imperial gallon storage. The screen is necessary to remove the small amount of pulp entrained in the liquor which, if not removed, would plug the yeast centrifuges. The liquor is stored hot and unneutralised to maintain sterility. The storage, in addition to acting as a reservoir, permits a certain amount of blending of the liquor from different blows. The liquor is pumped from storage to a head box in the alcohol plant and through a heat exchanger to one of three neutralising tanks. Regulation of the volume of water in the heat exchanger gives control of the temperatures to that required for the fermentation system. In the neutralisers, 11,000-gallon batches of the liquor are aerated to reduce sulphur dioxide, and lime is added to reduce the acidity to the required *p*H. At the conclusion of neutralising, the liquor is allowed to settle, the clear liquor pumped to the fermenters, and the sludge discharged to sewer. Nutrient salts as required are introduced at the pump suction on the way to fermenters.

Separation of Sludge

In the fermenters, yeast is added and the fermentation proceeds in 44,000-gallon batches in a pair of fermenters between which the liquor is circulated to keep the yeast from settling. At the conclusion of fermentation, the fermenting tanks are allowed to settle for about 2 hours, during which any heavier sludge falls to the bottom and then the bulk of the liquid is pumped through a decanter to the yeast separators. The decanter is primarily a safety head box with provision for automatic introduction of water if the wort flow is retarded for any reason. The centrifuges would be rapidly and seriously damaged if allowed to run dry. The clear wort from the centrifuges goes to the beer well and the yeast slurry to two 1100-gallon yeast storage tanks where it is ready for discharge to another fermentation cycle. The yeast is treated with sulphuric acid in these tanks in accordance with Melle practice. The sludge from the bottom of the fermenters is separated in a solid-basket centrifugal separator and the separated wort also goes to the beer wells, and thence to the distillation system.

When the digester is blown, the concentrated wash liquor is distributed throughout the whole fibrous sulphite pulp mass in the blow pit. The removal of a large portion of the liquor at maximum concentration is of basic importance to alcohol production.

The Thorold plant was erected without any United States priority assistance, and it was, therefore, not possible even to consider installing the stainless steel and rubber-covered washing equipment indicated for maximum recovery. The problem, therefore, becomes that of controlling drainage from the blow pit so as to provide a maximum degree of separation of liquor and wash water consistent with clearing the blow pits in advance of the next blow and proper pulp washing.

The specific steps to be taken to promote this are individual to each mill, being dependent on the details of the already installed blow and washing system, stock handling facilities, etc. Alterations to such a system designed to obtain more waste sulphite liquor must be economically justified in terms of increased sugar recovery. At present, recovery is something over 6½ tons equivalent concentrated liquor per ton of pulp. The recovery is estimated at 60 per cent. or slightly better at 80 per cent. concentration.

It is believed that the Canadian plant is ahead of even European practice, including the re-use process. The best information Dr. M. M. Rosten, consultant to the Ontario Paper Co., Ltd., on this project, had prior to the operation of the Thorold plant indicated a 45-hour fermenting cycle as against a 72-90 hour cycle by the older processes. In accordance with these data, the Thorold plant was designed on the basis of a 45-hour cycle. Experience has shown that the very substantial additional improvement noted can be obtained.

Urea Nutrient

Attention is also directed to the very small amount of nutrients used. This is in line with encouragement of minimum yeast growth consistent with a virile culture. Urea was the *only* nutrient used. No phosphorus was added and no potash.

Lime is that required for neutralising the waste sulphite liquor prior to fermentation. The liquor is adjusted slightly higher than *p*H6. Sulphuric acid is required for yeast treatment. The acidity of the fermenting wort increases slightly as fermentation proceeds and the final *p*H is very close to 5.

Some methyl alcohol is formed in the cooking process and the portion that remains in the waste sulphite liquor requires separation in the distillation column. This normally runs to something less than 4 per cent. of the alcohol produced and this is separated, as a mixture with the heads, to give a "methyl alcohol fraction" which, under good operating conditions, approaches 80 per cent. methyl alcohol.

Current quality data for ethyl alcohol are summarised in Table II. The company is under instructions to produce ethyl alcohol up to U.S. Army Specifications No. 1, and the alcohol complies with, and in some tests substantially exceeds, these specifications. The quality given in Table II must not be regarded in any sense as a limiting quality, and alcohol can be produced to meet any given industrial specifications.

One question on quality frequently asked

is how much sulphur the alcohol contains. This question arises because sulphite liquor is the raw material. From the standpoint of the industry, it must be answered without the slightest evasion. The sulphur content of Thorold alcohol, as analysed by a reputable laboratory, has been 1.4-2.1 parts per million total sulphur.

TABLE II

Ethyl Alcohol	Period May 1-25, 1944, Inclusive Daily Average
1. Residual acidity	0.0016%
2. Permanganate time	28 min.
3. Aldehydes, parts per 100,000 ...	1.8
4. Fusel oil, parts per 100,000 ...	7.7
5. Esters, parts per 100,000	2.4
6. Methyl alcohol	Nil*
7. Proof (Canadian)	68.8 O.P.
8. Residue on evaporation	0.0016%†

* Each day below 0.1% which is minimum determinable quantity.

† Average test on shipments made, not daily average.

By reduction of sugars and sulphur dioxide it is apparent that the alcohol process should substantially assist the river pollution characteristics of waste sulphite liquor. No detailed study has been made of this at Thorold. Samples of our effluents were, however, taken by representatives of the Sulphite Pulp Manufacturers' Committee on Waste Disposal (Wisconsin) and their examination gave a 43 per cent. reduction in B.O.D. for the liquor which goes through the alcohol plant, this figure including allowance for dilution in processing. Their advice also states that these results check well with their laboratory experience in which B.O.D. reductions of 40-50 per cent. were obtained by ethanol fermentation.

FOAMED SLAG HOUSES

Glasgow Corporation is proposing to erect a factory for the production of foamed slag building blocks, said Mr. Tom Johnston, Secretary of State for Scotland, at the formal opening of an experimental block of prefabricated foamed slag houses at Penilee, Glasgow, recently. He added that he hoped every facility would be given for the speedy erection of that factory. Housing needs were paramount, he added, and every possible augmentation to the normal housing programme must be adopted. Every possible alternative form of construction must be given a chance. The Weir steel house, which showed it had great possibilities, the Portal house, the foamed slag house, and others would, he hoped, be used to augment the ordinary building trade capacity, a capacity which was limited. Councillor George Smith, convener of the Glasgow Housing Committee, said that the Corporation had been working on the foamed slag type of house for two years. It was but one of the expedients which would be adopted to meet the clamant demand for houses.

Chlorine Dioxide

(*Continued from p. 249*)

at the bottom with a thin silver safety disc. Should an explosion occur, the disc in the tower affected will be ruptured, and most of the salt discharged into the base, where it will cool harmlessly. At the same time, any chlorine and chlorine dioxide discharged into the base will be vented to the outside air through a 3-in. pipe mounted on the base behind the towers. If any salt is ejected from the top of the tower, it will be caught in an external expansion chamber and kept out of the piping. The possibility of an explosion is remote, however, because the air-operated control valve in the chlorine line prevents chlorine from being fed into a tower unless it is diluted with a large volume of air.

Pressure Regulation

The chlorine dioxide formed in the generator, highly diluted with air, is led through Saran tubing to a manifold located in the top of the control panel. From the manifold run as many individual distribution lines as may be required. Included in each distribution line is a hand-operated control valve, a rotameter, and a valve for admitting by-pass air into the line. The total pressure of the ClO_2-air mixture in the manifold must be held constant under all conditions of gas flow demand. This control is effected by means of an Arca regulator, which is actuated by any change of gas pressure in the manifold.

The partial pressure of chlorine dioxide in the gas-air mixture must be carefully regulated for two reasons: (1) For most industrial applications, best results are obtained by supplying the chlorine dioxide within a definite range of partial pressures; (2) when the partial pressure of chlorine dioxide in the gas-air mixture exceeds 70 mm. of mercury, the mixture may explode on exposure to sunlight, heat, or an electric spark.

Research and commercial experience indicate that a partial pressure of 30 mm. of mercury for the chlorine dioxide is safe under ordinary operating conditions, and this is the highest partial pressure recommended for industrial work. In practice, however, much lower partial pressures are commonly used. For example, in bleaching flour, a partial pressure of 2 mm. of mercury is suitable. The partial pressure of the chlorine dioxide can be varied by keeping the air flow constant and adjusting the needle valve that controls the input of chlorine, and hence the output of chlorine dioxide. Or, if this method supplies the desired amount of chlorine dioxide at too high a partial pressure, the chlorine flow can be kept constant at the desired point and the air flow increased.

Personal Notes

MR. A. J. JONES and DR. D. RIDING have joined the board of Evans, Sons, Lescher & Webb, Ltd. Mr. Jones, who has been with the company for 25 years, has been manager of Evans' Fine Chemical Works for some years. Dr. Riding is medical director of the Evans Biological Institute. MR. C. E. J. SENDALL becomes a senior director of the firm.

A message of congratulation has been sent to-day on behalf of the board and the staff to LIEUT. N. B. L. WALLACE, R.N.V.R., one of the Scottish representatives of Benn Brothers, proprietors of THE CHEMICAL AGE, on the official announcement of the award to him of the Distinguished Service Cross "for gallantry, skill, determination, and undaunted devotion to duty during initial landings of Allied Forces on the coast of Normandy."

MR. C. V. TRELOAR, a managing director of Swift & Company Pty., Ltd., and a director of Chrome Chemicals (Aust.) Pty., Ltd., whose headquarters are at Sydney, Australia, has arrived in London via the U.S.A. and is staying at Grosvenor House. Swift & Company are well known in the field of both heavy, fine, and pharmaceutical chemicals, and are associated with the chrome chemical industry which has recently started production in Australia.

Obituary

The German press reports the death of DR. FRIEDRICH KORBER, director of the Kaiser Wilhelm Institute for Iron Research since 1922.

MR. PETER GRIFFITHS, Gorseinon, metallurgist to Baldwins, Ltd., Port Talbot, Glam., has been killed in a flying-bomb incident.

MR. WILLIAM CHARLES LOUTTIT, assistant works manager of the plastics plant of Canadian Industries, Ltd., Brownsburg, has died, aged 49, in hospital at Montreal as the result of injuries suffered in an accident at the plant at the end of June. Mr. Louttit was born in Scotland and was a graduate of McGill University.

MR. GEORGE GILFILAN GARDINER, whose death at the age of 71 is reported from Gourock, Scotland, retired in 1930 from the position of head of the chemistry department of Paisley Technical College. In his youth he studied at the Technical College for the London B.Sc. degree, and later he served on the college staff for over 20 years.

Recovery of secondary antimony in the U.S.A. in lead base and tin base alloys decreased from 18,200 tons in 1942 to 15,483 tons in 1943, according to the Bureau of Mines.

New Control Orders

Toluene

REGULATION of the prices for toluene, toluol, and materials containing 40 per cent. or more of toluene is transferred from the Minister of Supply to the Minister of Fuel and Power, by the Control of Toluene (No. 5) Order, 1944 (S. R. & O., 1944, No. 1003). Regulation of acquisition, disposal, use and consumption is being retained by the Ministry of Supply. The above Order revokes the previous Control of Toluene Orders made by the Minister of Supply, except the No. 1 Order which had already been revoked; repeats without any substantial amendment the previous provisions regulating acquisition, disposal, use and consumption; does not repeat the previous provisions regulating prices. New provisions regulating prices are contained in the Control of Benzole and Coal Spirit (No. 2) Order, 1944, which is being made by the Minister of Fuel and Power concurrently with the above Order.

Aluminium Alloy Scrap

The price control of aluminipm alloy scrap, imposed by Direction No. 2 of the Control of Aluminium (No. 5) Order, 1940, has been abolished by a direction of the Ministry of Aircraft Production (S. R. & O., 1944, No. 1009).

NEW COATING MATERIAL

A new all-British protective lining and coating material has recently been placed on the market by Prodorite, Ltd., of Wednesbury, Staffs. The new material, named "Prodor-Glas" is essentially a new synthetic resin of the phenol-formaldehyde group. Very durable and tough, with a high gloss, it is chemically inert, non-tainting, and completely sterile, and is resistant to attack by acids, salts, solvents, brines, foodstuffs, and most chemical and acid processes.

"Prodor-Glas" can be applied to metal plant and equipment and is subjected to a special stoving process involving relatively low temperatures, enabling the lining or coating to be applied to light-gauge metal articles. This leads to possibilities of reduction in weight of equipment that can be of particular importance in the bulk transport of liquids, specially advantageous to brewers, dairies, and mineral-water manufacturers.

The material has been evolved in such a way as to withstand mild alkaline detergents—a list of recommended brands can be supplied on application to the makers, who have also published a brochure dealing with the new material.

A CHEMIST'S BOOKSHELF

PLASTICS FOR PRODUCTION, by Paul I. Smith. London: Chapman & Hall. Pp. 180, with seven plates. 12s. 6d.

The number of books about plastics is steadily increasing. Many of the volumes contain little new information, being in the nature of compilations. They are nevertheless valuable because of that, since they usually provide not only useful references but often a great deal of handy information which would be a nuisance to find if one had to extract it from original articles and papers. "Plastics for Production" is of this type, and is to be ranked as a conscientious work of compilation, a wealth of practical detail having been painstakingly collated. The utilisation and fabrication of plastics are looked at from many angles. For instance, there are chapters that adequately cover such matters as methods of moulding, types of mould, choice of material according to the purpose the fabricated article has to fulfil, and the use of plastics as glass substitutes and for insulation. The final chapters summarise the characteristics of the main thermosetting and thermoplastic resins, and the tables they contain are particularly handy. Of special interest to the chemical industry will be the section dealing with the use of plastics in the design of corrosion-resistant chemical plant. There is, for instance, a page dealing with asbestos acid-digested resins such as Keebush and Haveg, and even more about Saran; this disproportion is somewhat tantalising to British readers since Saran is practically unobtainable here.

SALTS AND THEIR REACTIONS. By Leonard Dobbin, Ph.D., and John E. Mackenzie, D.Sc. 7th Ed. Edinburgh: E. & S. Livingstone. Pp. 246. 8s. 6d.

This useful class book of practical chemistry, which first appeared in 1904, has now reached its seventh edition. The course of practical work outlined in it is intended for students up to Inter. B.Sc. standard or thereabouts.

SWEDISH-MADE DRUGS

A new local anaesthetic, known as LL 30 (the letters stand for the names of the scientists who discovered it—Lövgren and Lundqvist), is being made by the Astra concern of Södertälje, near Stockholm. LL 30 is more active than novocaine, the doses needed being correspondingly smaller. It will keep in solution for a practically unlimited time, is simpler to manufacture than novocaine and acts much more quickly. Penicillin is also being made at the Astra Works—for the present only in the laboratory, but plans are being made for large-scale production of this drug. Sulphonamide preparations are now being produced from all-Swedish raw materials. It may be of interest to note that the head of the Astra laboratory, Mr. Bertil Sjögren, together with a Swedish colleague, discovered sulphathiazole at the same time as it was first produced by American and Swiss research chemists.

Protection for Exporters

Exports Credits Guarantees

UNDER the provisions of the Export Guarantees Act, 1939, the Export Credits Guarantee Department is authorised to give guarantees to United Kingdom exporters for the purpose of encouraging export trade. War conditions have greatly increased the risks to which exporters are exposed in overseas trading, and the Department has put into operation special facilities giving them protection against these risks on exceptionally favourable terms.

The standard form of cover is the War Emergency policy which covers the exporter of consumable goods sold for cash, or on short credit, from the time he books an order until he receives the amount due to him in payment for the goods. An exporter who is prepared to insure with the Department the whole of his export orders can thus obtain protection against loss due to: (a) his buyer's insolvency; (b) exchange restrictions in the buyer's country; (c) events such as war in the buyer's country preventing payment for goods shipped or preventing their delivery; (d) additional handling, insurance and freight charges not covered by Marine or Government war risk policies caused by interruption or diversion (through British Government instructions) of the voyage on which the goods are shipped.

The cover at present available is either 85 per cent. or 90 per cent., according to the particular risk. The Department also issues a policy which enables exporters to quote firm c.i.f. prices some months ahead of shipment. Under this guarantee exporters in respect of any c.i.f. transaction are covered against any rise in marine insurance, Government war risk insurance and freight rates occurring within an agreed period (normally six months). Other policies are available to meet special requirements of exporters in particular cases. The strictest secrecy is observed in all correspondence and transactions. Exporters are invited to apply for further particulars to the Headquarters of the Export Credits Guarantee Department at 9 Clements Lane, Lombard Street, London, E.C.4, or to any of the seven branch offices. In many industrial towns where the Department has no office the secretary of the local Chamber of Commerce has undertaken to arrange appointments for interviews with officers of the Department visiting the locality.

CHEMICALS IN PERU

Plans for the local production of zinc oxide, zinc sulphate, potassium carbonate, and borax were the principal developments in Peru's chemical-manufacturing industry in 1943, reports *Foreign Commerce Weekly*. A newly-established company, Productora Peruana, S.A., started manufacture of zinc sulphate (crystals and granulated) in 1943 and will produce copper sulphate, potassium carbonate, and borax this year. Output of zinc sulphate is expected to total 200 tons in 1944. The principal raw materials, zinc and sulphuric acid, are available in sufficient quantities. Productora Peruana, S.A., is aiming to produce 200 tons of copper sulphate a year, which is sufficient to supply one-third of the estimated current demand. Using ashes obtained locally, the same company expects to produce approximately 30 tons of potassium carbonate in 1944, principally for soap and glass manufacturers; this amount should meet almost half of the local demand for this product. Approximately 30 tons of borax will also be produced by the company this year. Its supplies of borax are obtained in the Arequipa region and will be refined in Lima.

General News—From Week to Week

During July employees of nearly 400 firms and organisations in England and Wales joined the Red Cross Penny-a-Week Fund.

A Joint Research Council, on the lines of that set up by the Manchester Chamber of Commerce, may be set up by the equivalent bodies in Edinburgh.

The Ministry of Food announces that there will be no change in the existing prices of unrefined oils and fats and technical animal fats allocated to primary wholesalers and large trade users during the four weeks ending September 30.

An explosion in an oil vat at the works of Croda, Ltd., wool grease manufacturers, of Rawcliffe Bridge, recently resulted in two deaths. Three lead burners were relining the vat when the explosion occurred and all suffered extensively from burns and shock, two of the men dying from their injuries, reports the *Chemical Worker*.

The Joint Conference on "Instruments for the Automatic Controlling and Recording of Chemical and other Processes," which was to be held in London on September 22-23, 1944, by the Institution of Chemical Engineers, the Institute of Physics and the Chemical Engineering Group, has been postponed.

George Cohen Sons & Co., Ltd., of Wood Lane, London, W.12, and Stanningley, near Leeds, have just acquired the whole of the plant and machinery of Suncole Works, Cinderhill, Nottingham. This plant was put down new in 1938 and only worked a few months. Designed for the production of solid fuel, etc., it comprises rotary retorts, distillation plant, gas producers, very large conveyors, aerial ropeway, two 500 kW. turbo sets, two 25,000 lb. Babcock boilers, sidings and a considerable quantity of plant of a general nature. Everything is for disposal, and a catalogue is available on application.

The Treasury has made an order exempting from Key Industry Duty potassium bromide crystals and R grade potassium chloride crystals, not optically worked, weighing not less than 2.5 grams each. The order is effective from August 30, 1944, until June 30, 1945. Copies of the order (S.R. & O. 1944, No. 927), entitled "The Safeguarding of Industries (Exemption) No. 3 Order, 1944," are obtainable, price 1d., from the Stationery Office.

Purchase Tax Notice No. 78, relating to the liability of goods to Purchase Tax, has been revised. The new edition supersedes the edition of Notice No. 78, published in September, 1942, and all Press Notices issued prior to July 1, 1944, relating to the liability of goods *other than* Young Children's Clothing and goods in Classes 19, 20 and 21. Copies may be obtained from local Officers of Customs and Excise or from the Secretaries' Office, Customs and Excise, City Gate House, Finsbury Square, London, E.C.2.

The Industrial Research Committee of the Federation of British Industries has passed the following resolution: "This committee notes with the greatest satisfaction the generous and inspiring example created by I.C.I., Ltd., in providing 80 post-graduate research fellowships tenable at the principal universities, and expresses the hope that this example will be followed by all the major industries as one of the most effective means of providing research facilities and staff, on which the future well-being of British industry so largely depends."

Foreign News

Mexico and Argentina are reported to be negotiating a barter agreement under which surpluses of Argentine wheat would be exchanged for certain Mexican oil products.

Large bauxite deposits covering over 120 sq. kilometres were discovered on Hokkaido, one of the main Japanese islands. Exploitation is to proceed by surface mining.

Finland's fertiliser output will be increased by some 50,000 tons annually, when a new company known as Typpi O.Y., founded with Government support, begins production, using the Haber-Bosch process.

A new sheet-glass factory in Istanbul, equipped with German machinery, has started production. As soon as its capacity is fully utilised, Turkey will become independent of foreign window-glass supplies.

New Zealand's agar output is sufficient to meet all home requirements, and within a few months considerable quantities will be available for export as the rate of production is increasing steadily.

Messrs. Leeds & Northrup Co., 4934 Stenton Avenue, Philadelphia 44, Penna., have just issued their revised Catalogue E-33A (1) describing the "Wenner Thermocouple Potentiometer."

A conference on "Chemical Education and the Post-War Era" in New York, arranged by the American Chemical Society, is to be attended by several hundred chemistry teachers.

Another important advance has been made in development of industry in the Urals by the opening of a coking plant at Chelyabinsk, where metallurgical works rivalling the famous Magnitogorsk works are under construction. The new plant is stated to have a capacity of nearly 500,000 tons a year, reports a *Times* correspondent.

A munitions plant in New South Wales has been leased by the Australian Government, it is reported, to the Burlington Company of America and its Australian associate, for the production of rayon. The Burlington Company will provide the machinery and a few technicians on loan as instructors; the raw material will come almost entirely from the United Kingdom.

A new thermoplastic, the first ever developed that can hold its shape and strength in boiling water and yet can be moulded by the fastest, most economical, methods, has been anounced by Monsanto Chemical Co. of America. Known as Cerex, the new plastic opens up a wide field of industrial and household application by virtue of its ability to withstand sterilisation.

The recently formed Sugar Research Foundation of America has already allocated some $200,000, of which $125,000 has gone to the Massachusetts Institute of Technology for fundamental research and development of industrial uses of sugar. Other investigations are being carried out on behalf of the Foundation at the Universities of Harvard, Minnesota, and Iowa State.

Deposits of antimony extending over 683 hectares have been discovered in the Tokat province of Anatolia. The State-owned Eti bank is financing the exploitation of the ore.

In Australia, the import of naphthalene, liquid hydrocyanic acid gas, hydrosulphites, scientific apparatus and thermometers has been exempt from licensing, according to *The Board of Trade Journal*. Barium carbonate, zinc chloride, and essential oils are now admissible on a 100 per cent. quota basis.

The U.S. Rubber Director has agreed to the diversion of 400,000 barrels of butylene from the synthetic rubber programme to the manufacture of 100-octane petrol. Together with ethyl benzene made available from styrene plants, this will make possible the preparation of a million barrels of high-octane spirit. It involves the sacrifice of 30,000 tons of Buna synthetic rubber.

Six photographic sensitisers needed for the manufacture of photographic plates are being produced in India from local materials. Two of them, powerful orthochromatic sensitisers, sold under the names "Sensitine D" and "Sensitine Q," are said to be new to the industry. Production is supported by research work carried out under the auspices of the Council of Scientific and Industrial Research of India.

The scale of vitamin manufacture in the United States was indicated by Mr. C. V. Holland, of Merck & Co., when he addressed the American Institute of Chemical Engineers in Cleveland recently. He stated that 11,000 tons of sulphuric acid, half a million gallons of various alcohols, 1000 tons of chloroform, and about 3000 tons of ammonia were used in making the $200,000,000 worth of vitamins sold annually in the United States.

Three Canadian firms have produced 425,000 short tons of ammonium nitrate from the time the war stared to March 31, 1944. The firms are the Alberta Nitrogen Products, Ltd., Consolidated Mining and Smelting Co., Ltd., and the Welland Chemical Works, Ltd. Of this amount, 130,000 short tons have been exported to the United States for use as a commercial fertiliser, and for the same purpose, 23,000 tons have been sold in Canada.

A National Vitamin Association has been formed in the United States. Its objects are to make grants for research in the vitamin or related fields, disseminate information to the vitamins trade, medical profession, and the public regarding the quality, purpose, and uses of vitamins, adopt terminology and standards of publicity practices in connection with sales, and confer with medical societies, medical schools, health organisations, and Government agencies with respect to the industry.

Forthcoming Events

The London Section of the **British Association of Chemists** is meting on **September 13**, at 6.30 p.m., in the Chemical Society's Rooms, Burlington House, Piccadilly, to hear a lecture by Mr. H. W. Rowell, M.I.Chem.E., on "The Development of Plastics."

The annual meeting of the British section of the **International Society of Leather Trades' Chemists** will be held in the small chemistry lecture theatre of Leeds University on **September 15** and **16.** The afternoon of the first day will be devoted to a symposium on "The Essential Qualities of Various Types of Leathers," which will include contributions by Dr. D. Burton, Miss G. O. Conabere, B.Sc., Dr. R. H. Marriott, Mr. W. R. Atkin, M.Sc., Dr. L. Goldman, Ph.D., Mr. A. Cheshire, B.Sc., and Mr. G. Forsyth. The symposium continues on the Saturday morning with papers by Mr. W. E. Palmer, M.A., B.Sc., Mr. W. R. Ingle, and Mr. F. H. Quinn, M.Sc.

The London section of the **Electrodepositors' Technical Society** meets on **September 18,** at 5.30 p.m., at the Northampton Polytechnic, St. John Street, E.C.1, to hear a paper by Mr. O. Wright entitled "Lead and Allied Plating of Bearings."

The 36th annual autumn meeting of the **Institute of Metals** will be held at the James Watt Memorial Institute, Great Charles Street, Birmingham, on **September 20,** at 2.15 p.m. A discussion on the melting and casting of bronze will follow the business meeting.

The 34th ordinary meeting of the **British Society for International Bibliography** will be held in the Council Room at the Institution of Electrical Engineers, Savoy Place, Victoria Embankment, W.C.2, on **September 26,** at 2.30 p.m. Dr. S. C. Bradford will read a paper on "Some General Principles of Bibliographical Classification, with application to the Universal Decimal Classification." A paper on "The Classification of Literature in the Technical Department of an Oil Company," by C. L. Gilbert, B.Sc., F.Inst.Pet., and C. G. Gray, B.Sc., Asiatic Petroleum Co., will follow.

Company News

The directors of the **Bradford Dyers' Association, Ltd.,** have decided to pay on September 30 the dividend on the 5 per cent. cumulative preference stock for the half-year ended June 30, 1944.

Samuel Ward & Co., Ltd., paint and varnish manufacturers, Slough, have increased their nominal capital by the addition of £10,000 in £1 ordinary shares beyond the registered capital of £25,000.

The United Indigo and Chemical Co., Ltd., announce a net profit, for the year to June 30, of £9831 (£9654), and dividend of 6¼ per cent. (same) on the ordinary shares.

Timothy Whites & Taylors, Ltd., announce a net profit, for the year to December 25, 1943, of £138,312 (£137,077), after debenture interest, war damage, depreciation at £19,548 (£19,821), deferred repairs at £67,721 (£37,300), and taxation at £237,500 (£167,700). After a further ordinary dividend of 22½ per cent., making 30 per cent. (same), £80,279 are carried forward. Since December 25 all the ordinary shares and some of the preference shares of Mence Smiths Stores (Proprietors), and 37 shops in the south of England formerly carried on by J. Salmon and Sons, were purchased in view of a post-war scheme of development. In the balance sheet stock-in-trade and debtors are £1,191,534 (£1,382,249), and cash is £185,778 (£38,983). Meeting, September 13.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

DURSTON, LANG & CO., LTD., London, W., manufacturers of fire extinguishing machines. (M., 9/9/44.) August 16, £50 debenture, to Edge & Co., Ltd.; general charge. *Nil. January 5, 1944.

W. A. MITCHELL & SMITH, LTD., Mitcham, chemical manufacturers. (M., 9/9/44.) August 19, £3000 (not ex.) charge to Lloyds Bank, Ltd.; charged on property and works at Church Path, Mitcham. *£1041. July 15, 1944.

New Companies Registered

Vitaproducts (London), Ltd. (389,539).—Private company. Capital: £1000 in 1000 shares of £1 each. Wholesale, retail, manufacturing and general chemists. Subscribers: G. A. Stanley, Dr. A. Clark (first director). Registered office: 142 The Grove, Stratford, London, E.15.

Palatine Sales Promotion, Ltd. (389,534).—Private company. Capital: £1000 in 4000

shares of 5s. each. Sales promoters and distributors for manufacturers, etc., of disinfectants, detergents, cleaning substances, fertilisers, etc. Directors: G. D. Storrie, 48 Hesketh Avenue, Bispham, Blackpool; Dr. S. Marian; Mrs. G. Storrie.

Peat & Charcoal, Ltd. (389,535).—Private company. Capital: £1000 in 4000 shares of 5s. each. Manufacturers, producers, distillers, refiners, importers, exporters, merchants and factors of and dealers in charcoal, peat and residuals obtained therefrom, disinfectants, case-hardening compounds, fertilisers, etc. Directors: Dr. S. Marian, Oakstead Cottage, Cheriton Bishop, Exeter; G. D. Storrie; Mrs. M. L. Cotton.

Chemical and Allied Stocks and Shares

AN easier tendency prevailed in stock markets, movements in industrial shares being small but slightly reactionary, and British Funds lost some of their recent strength. There has been very little selling, but with the war news centring attention on the switch-over to peace-time working, leading industrials have been in smaller demand because in some cases prices may already have reached levels which discount the possibility of improved results and dividends after the war.

Imperial Chemical were little changed at 38s. 6d., B. Laporte were again firm at 85s., Barry & Staines slightly easier at 51s. 3d. following an earlier rise, and Borax Consolidated deferred 38s. The Allied advance into Holland had a favourable influence on Lever & Unilever, which further strengthened to 41s. 7½d. as the time may be approaching when the position of Lever N.V., the Dutch sister company, can be assessed. Shares of the latter were higher at 41s. 10½d. Royal Dutch Oil shares were also higher at 34s. British Oil & Cake Mills preferred were better at 50s. 9d. Activity was shown in Triplex Glass, but the price went back to 42s. awaiting the forthcoming dividend announcement. Reflecting the surrounding market trend, United Molasses eased to 38s., Wall Paper Manufacturers deferred to 43s. 3d., and International Paint to 117s. 6d. General Refractories 10s. ordinary shares had a firmer appearance at 17s. 10½d., the market view being that, bearing in mind that the company's products are used in many trades, there may be scope for higher earnings and dividends after the war. Activity has been shown in Dunlop Rubber ordinary units, which changed hands around 48s., it being pointed out that the company has important connections and interests in Europe which may become of importance as time proceeds. Babcock & Wilcox became firmer at 51s.; in this case also there are interests in Europe and elsewhere. Courtaulds have also attracted attention on the company's French and other European interests, but best prices were not held; and in sympathy with the easier tendency in textile shares, the price eased off to 57s. 6d. British Celanese were lower at 28s. 9d., Bradford Dyers 23s. 4½d., and Bleachers 12s. 6d., but Calico Printers were firmer at 17s. 3d. on the payment in respect of preference dividend arrears.

Tendency in the iron and steel section was better, with United Steel 25s., Dorman Long 27s. 7½d., Guest Keen 38s. 6d., Stewarts bridge 49s. 3d., and Staveley firm on the higher dividend at 53s. 6d. xd. Stewarts & Lloyds were 54s., Tube Investments 96s. 10½d., and Richard Thomas 6s. 8d. units 12s. 9d. Elsewhere, a good impression was created by the higher British Oxygen interim dividend, and the ordinary units were 88s. 9d. xd. British Aluminium were 49s. 3d., and Metal Box shares 91s. 6d., while Imperial Smelting strengthened to 14s. 6d.

Gas Light & Coke ordinary were higher at 22s. 7½d., and shares of other gas companies moved up on the prospect of an early relaxation of black-out regulations. In other directions, the units of the Distillers Co. strengthened to 102s. 3d. Boots Drug were 55s. xd., Sangers 27s. 3d., and Beechams deferred 18s. 9d. Timothy Whites firmed up to 39s. 6d. on the higher earnings shown by the results. Turner & Newall were 81s. 6d., Murex 98s. 9d., and W. J. Bush 65s. Monsanto Chemicals 5½ per cent. preference were 23s., Greeff-Chemicals Holdings 5s. units 8s. 3d., Cellon 5s. ordinary 24s. 6d., and British Drug Houses 28s. 6d. Shares of companies interested in plastics were little changed, with De La Rue 183s. 9d., British Industrial Plastics 2s. shares 7s. 6d., and Erinoid 11s. 6d. Lewis Berger eased to 109s. Oil shares held earlier gains, "Shell" being 85s. 7½d. and Burmah Oil 90s.

British Chemical Prices

Market Reports

QUIET conditions continue in the London general chemicals market, which is still influenced by the holiday period, and little interest in fresh business has been reported. Prices show no change on the week and the undertone remains firm. In the soda products market a fair trade is passing in bicarbonate and chlorate of soda, while percarbonate and nitrate of soda are steady. A moderate inquiry is reported for soda ash, Glauber salt and salt cake. Supplies of hyposulphite of soda are moving steadily into consumption, chiefly against contracts. There is no change in the position of the potash products, offers of most items being quickly absorbed. Among the miscellaneous

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Caustic Potash (all grades)	Methyl Cellulose	Sodium Bichromate	Thio Urea
Cellulose Adhesives	Methylene Chloride	Sodium Chlorate	Urea
Coumarone Resin	Oxalic Acid and Salts	Sodium Nitrate	Wax Substitutes
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chemicals a moderate trade is passing in white acetate of lead, and the lead oxides continue firm at unchanged rates. White powdered arsenic is a good market and a brisk inquiry is reported for British-made formaldehyde and crude and refined glycerine. Trade in the coal-tar products market has been of moderate dimensions, with contract deliveries for carbolic acid and cresylic acid continuing on steady lines. A fair inquiry is reported for the xylols and the pyridines.

MANCHESTER.—Prices have maintained a steady tone in virtually all sections of the Manchester market for heavy chemicals during the past week, with little in the way of active change to report. New inquiries relating to a fairly wide range of products have been on a slightly better scale and, on the whole, actual deliveries of textile bleaching, dyeing, finishing, and other chemicals have been reasonably steady, holiday interruptions to the flow of specifications having been rather less in evidence. Pressure of supplies of the leading coal-tar products in both the light and the heavy sections has been maintained, and fresh inquiries have been in the market during the past few days.

GLASGOW.—In the Scottish heavy chemical trade there has been a slight improvement during the past week for home business. Export inquiries still remain rather limited. Prices keep firm at previous levels.

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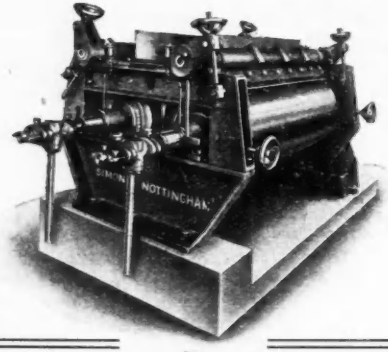

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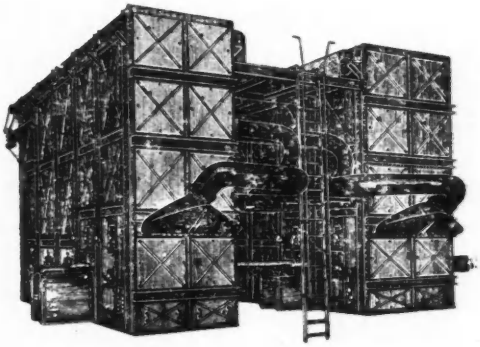

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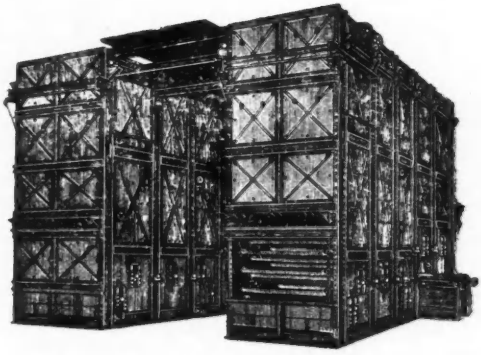

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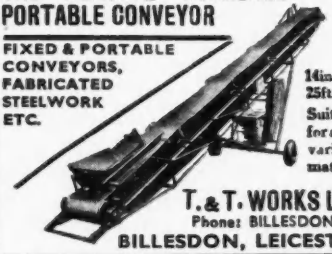
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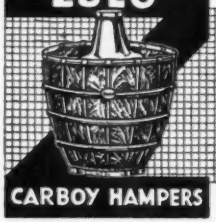
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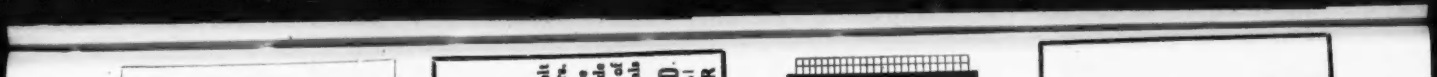

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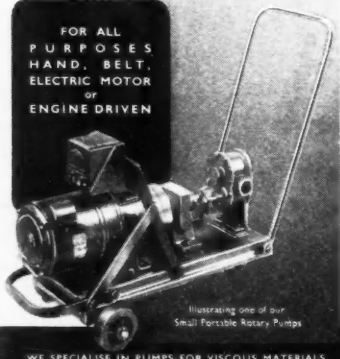

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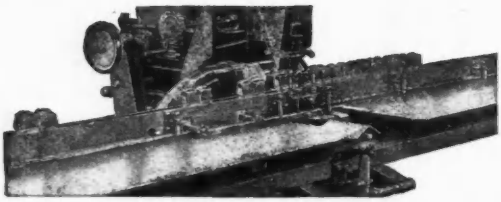

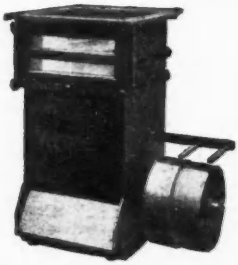

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